



Progress in the Diagnosis and Treatment of Urinary Retention during Pregnancy

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【Abstract】 The incidence of urinary retention during pregnancy is low which is mainly manifested as dysuria, frequent urination, incomplete urination, lower abdominal distension and abdominal pain and may induce severe complications and adverse pregnancy outcomes, so the early identification and treatment of urinary retention during pregnancy are crucial in clinical practice. Only by timely symptomatic and etiological treatment can the adverse outcome be avoided. This article made a review of the research progress of etiology, diagnosis and treatment, to provide diagnostic and therapeutic approaches and reference for clinical physicians.

【Key words】 Urinary retention; Pregnancy; Pregnancy outcome; Diagnosis, differential; Catheterization; Review

Urinary retention is a condition in which the bladder fills up with urine and cannot be emptied, often caused by difficulty in urination that has progressed to a certain level. Urinary retention is common in older men and is more rare in women. The incidence of urinary retention in pregnancy is low, but it can cause serious complications, such as recurrent urinary tract infections, acute renal failure, bladder rupture, miscarriage, uterine rupture, etc^[1-3], which jeopardizes the safety of the mother and baby, so early recognition and management is crucial. This study summarizes and analyzes the etiology, pathogenesis, diagnosis and treatment of urinary retention in pregnancy in the light of the cases of urinary retention in pregnancy reported in the literature at home and abroad, in order to improve the early diagnosis and management of this disease by clinicians.

1 Epidemiology

Urinary retention is rare in women, with an incidence of 0.07 per 1,000^[4], and the incidence of urinary retention in pregnancy is 4.7 per 1,000^[5], and most of the current literature on urinary retention in pregnancy consists of case reports, with only one larger retrospective case-cohort study^[5]. Case reports of urinary retention in pregnancy occur between 6 and 23 weeks of gestation, with the majority occurring between 10 and 18 weeks of gestation. A

retrospective case-control study investigated the epidemiology and risk factors of urinary retention in pregnancy, including 65,490 pregnant women from 1998 to 2011, with 308 cases of urinary retention in pregnancy, and the peak period of urinary retention was from 9 to 16 weeks of gestation, which was twice as high as the other gestational weeks; the risk of acute urinary retention increased with the patient's age, and the risk of acute urinary retention was significantly higher in patients >35 years of age. The risk of acute urinary retention increases with the age of the patient, and the risk of acute urinary retention in patients >35 years old is significantly higher than that in patients <20 years old, with an OR of 2.62. The risks of acute urinary retention in women with preterm, full-term, and expired pregnancies are 2.18%, 0.33%, and 0.46%, respectively, and the risk of preterm labor is significantly correlated with acute urinary retention, with an OR of 6.33^[5].

2 Risk factors for morbidity

2.1 Related to pregnancy Whether pregnancy itself causes urinary retention is inconclusive, but physiologic changes in the urinary system during pregnancy have a certain correlation with the occurrence of urinary retention. During pregnancy, glomerular filtration rate increases, urine output increases, smooth muscle relaxation under the action of progesterone, ureteral peristalsis is weakened, resulting in mild dilatation of the renal pelvis and ureter, and with the uterus enlarging in the middle and late stages of pregnancy, the position of the bladder rises. In the middle and late stages of pregnancy, with the increase of the uterus, the bladder position rises and the bladder triangle is elevated, which can lead to poor urine circulation and aggravate the dilatation of the ureter, and the enlarged uterus or the descent of the preeclampsia makes the pelvic space congested, and the bladder capacity decreases, which results in frequent urination^[6].

2.2 The factors of uterus The most common cause of urinary retention in pregnancy is gestational uterine impaction. Retroversion of the uterus is not uncommon, with an incidence of 15% in early pregnancy, most of which correct spontaneously by 14 weeks, but if the uterus is embedded in the pelvic sacral recess and is unable to rise into the abdominal cavity, it is known as gestational uterine incarceration, with a prevalence of 1/3,000^[7]. Risk factors for gestational uterine incarceration include endometriosis, adenomyosis, posterior uterine wall leiomyoma, and pelvic adhesions^[3, 8], and 53.7% of gestational uterine incarceration occur with urinary symptoms, including urinary retention, urinary frequency, urinary urgency, and urinary incontinence^[9]. If urinary retention occurs in the previous pregnancy, it may still occur in the second pregnancy^[10]. YANG et al^[11] observed the urinary changes of acute urinary retention caused by non-pregnant uterine fibroids and uterine tilting in pregnancy through ultrasound, and revealed the mechanism of urinary retention caused by pelvic mass: non-pregnant uterine fibroids or uterine tilting in

pregnancy made the cervix shift forward and upward, compressing the lower part of the bladder, and covering the inner opening of the urethra, thus interferes with urination without pressure or thinning of the urethra itself. Daytime bladder pressure causes frequent urination. Frequent urination prevents over distension of the bladder, and urine accumulates in the lower part of the bladder when standing, preventing pressure on the urethral opening. In the supine position, the upper part of the bladder is prolapsed, and urine accumulates in the upper part of the bladder by gravity, causing the lower part of the bladder to collapse, which, together with the pressure of the upper part of the bladder on the uterus, indirectly aggravates the pressure on the urethral opening, which is even more pronounced when too much fluid is ingested.

2.3 Other factors The rarer causes of urinary retention in pregnancy include uterine prolapse, cervical pregnancy, bladder tumors, meningiomas, Gartner's abscess, and bladder diverticula [2, 12-15]. These rare causes can be analyzed and classified into the following categories: (1) obstructive, such as abnormal bladder position and urethral obstruction; (2) neurological, such as cauda equina and spinal cord injuries; and (3) abnormal contraction of the periurethral muscles, such as Fowler's syndrome.

3 Clinical characteristics and diagnosis

The clinical manifestations of urinary retention in pregnancy present diversity, dominated by urinary symptoms, the most common is difficulty in urination, but also includes urinary frequency, incomplete urination, followed by lower abdominal distension, abdominal pain, etc., but also can be accompanied by other manifestations, such as vaginal bleeding, back pain, perineal edema, constipation and so on. Vaginal bleeding in early pregnancy, abnormal position of the fetal sac, and urinary retention, if present, should alert the cervical pregnancy^[14]. In the presence of gestational uterine incarceration, the cervix is significantly elevated during speculum examination, with difficulty in exposure, extreme retroversion of the uterus can be palpated in the bipartite diagnosis, compression of the rectum, the height of the uterine fundus is lower than the normal week of gestation, and the fetal heartbeat is more difficult to hear. Urinary retention is defined as the inability to urinate spontaneously. There is no standard definition of residual urine, the volume of normal bladder is 400~600 mL, and the volume of bladder is >600 mL in overdistension^[16], and it is generally believed that residual urine >100~150 mL is considered to be urinary retention, and intermittent catheterization is required.

4 Ancillary examinations

4.1 Imaging examination

4.1.1 Ultrasonography Ultrasound is reproducible and noninvasive, and it can better assess intravesical

conditions, renal morphology, and anatomical changes in the lower urinary tract, making it the preferred test for urinary retention in pregnancy. Transvaginal ultrasound is superior to transabdominal ultrasound in the assessment of lower urinary tract changes caused by pelvic masses^[11]. Ultrasound can also assess residual urine and guide the clinical choice of the clinical selection of the timing of indwelling urinary catheter, and reduce the damage of repeated indwelling urinary catheter.^[17]

4.1.2 MRI examination MRI for acute urinary retention in the middle and late stages of pregnancy has a multidimensional imaging function and a larger field of view window, and is more superior in displaying the uterus and the surrounding intestines, blood vessels, and bladder tissue contrast^[17], although there are fewer examinations on MRI in the literature, but in the event of a diagnosis that can not be clarified, it is possible to consider perfecting the MRI examination for further differentiation. The placenta at the base of the uterus may be considered as placenta praevia in the case of uterine incarceration, which can be clarified by MRI.

4.1.3 Cystoscopy Cystoscopy visualizes the shape of the bladder and urethra, and determines whether there are obstructive lesions such as bladder and urethra compression, and also excludes bladder tumors, so it can be considered when the diagnosis is not clear.

4.2 Laboratory tests Urinary retention in pregnancy may be accompanied by urinary complications, including acute renal failure and urinary tract infection, but it is uncommon. Laboratory examination focuses on monitoring renal function and electrolytes, while improving urine routine and urine culture to exclude the possibility of urinary tract infection. In addition to urinary complications, attention should also be paid to the abnormalities of other system indicators.

5 Treatment and prevention

5.1 Treatment The first symptomatic treatment should be timely emptying of the bladder to relieve symptoms, the most commonly chosen way is indwelling catheterization, but the long duration of indwelling urinary catheter can increase the risk of urinary tract infection, the literature also mentions that self-intermittent clean catheterization can be used, but the patient's compliance is low. The short duration of indwelling urinary catheter may lead to recurrence of urinary retention in a short period of time, and it was found that indwelling urinary catheter for 7 d compared with 3 d in patients with urinary retention in pregnancy can adequately drain urine, improve clinical efficiency, and not increase the risk of urinary tract infection^[18]. Secondly, we should treat the cause of urinary retention as early as possible, and identify the cause of urinary retention. For those with uterine incarceration in pregnancy, the uterus can be reset by manipulation, and the success rate of reset is high before the 15th week; if it is

difficult to reset the uterus directly, the uterus can be reset under general anesthesia or assisted in reset by proctoscopy, and reset under laparoscopy if necessary; for those with endometriosis, we can choose to have laparoscopic exploration; for those with uterine fibroid compression, we can have myomectomy of uterine fibroids when necessary. Although there have been reports of cases of normal pregnancy to full term after myomectomy in pregnancy^[19], surgery in pregnancy increases the risk of miscarriage and needs to be considered with caution; in cases of uterine prolapse, uterine supports can be placed. For those with unknown etiology, multidisciplinary consultation is performed when necessary.

5.2 Prevention It is very important to avoid holding urine for a long time and develop good habits during pregnancy; for those with posterior uterine tilt, pay attention to the presence of high-risk factors for urinary retention, such as difficulty in urination, abdominal pain, abdominal distension symptoms, before 14 weeks, and once urinary retention occurs, seek medical attention at the hospital as soon as possible; for larger uterine leiomyosarcomas, especially posterior wall leiomyosarcomas, surgical treatment may be considered prior to pregnancy. The following measures are recommended by Yang et al^[11] to avoid urinary retention caused by pelvic masses: (1) limiting fluid intake before bedtime, (2) changing the supine position to a prone one for a period of time before getting up to go to the toilet, (3) leaning forward when starting to urinate, (4) avoiding any Valsalva maneuver and using Crede's maneuver to initiate or maintain micturition.

6 Analysis of literature related to urinary retention in pregnancy

This article summarizes and analyzes the recently published literature on urinary retention in pregnancy, and summarizes the risk factors, clinical features, treatment outcomes and recurrence, which is more conducive to clinicians' learning and reference.

6.1 Literature search A computerized search was conducted on CNKI, Wanfang, and PubMed, with the search term "urinary retention AND pregnancy" in Chinese and "urinary retention AND pregnancy" in English, and the search time was 2010. The search period was from 2010 to the present, and 11 Chinese and English articles^[1, 8-9, 12-13, 17, 20-24] were included, totaling 19 patients. The data of all cases were analyzed and their clinical characteristics were summarized, as shown in table 1.

Table 1 Clinical characteristics of 19 cases

Case number	First author	Publishing time (year)	Age	Maternal history	Weeks of pregnancy	Clinical manifestation	Complications/Comorbidities	Clinical examination	Auxiliary examination	Treatment	Days of indwelling urinary catheter (d)	Urinary retention recurrence	Prognosis
1	TUPIKOWSKI	2011	29	G1P0	18	Difficulty urinating	Bladder neck leiomyoma	—	Ultrasound, cystoscopy, MRI	—	—	No	Cesarean section at 36 weeks gestation
2	MARTNEZ-VAREA	2013	35	G7P1	14	Abdominal pain, difficulty urination in	Uterine prolapse	Uterine prolapse 2nd degree, palpable full bladder	Ultrasound	Manual repositioning of uterus, catheterization 500 mL, placement of uterine tray	0	Yes, recurrence of urinary retention after 1 d, replacement of uterine tray	Delivery of a live baby with premature rupture of membranes at 36 weeks' gestation
3	LAM	2015	31	G5P1	18	Difficulty urinating, urgency to urinate, inability to empty bladder	Uterine impaction in pregnancy, endometriosis	Bladder full, uterus implanted in pelvis	Pelvic ultrasound	Urinary catheterization 1,800 mL, manipulation of uterus to reposition the uterus	2	No	Live birth at 39 weeks' gestation
4	SLAMA	2015	37	G6P2	13	Difficulty urinating	Difficulty urinating uterine incarceration in pregnancy	Bilateral cribriform angle tenderness	Pelvic ultrasound	Catheterization, uterine tray for 3 weeks, intermittent self-catheterization	0	No	Relief after 3 weeks
			42	G5P3	13	Difficulty urinating	Uterine incarceration in pregnancy	—	ultrasound	Catheterization, uterine tray for 3 weeks, intermittent self-catheterization	0	No	Relieved after 3 weeks
			22	G15P5	21	Difficulty urinating, left upper abdominal pain, nausea	Uterine incarceration in pregnancy	—	ultrasound	Catheterization, uterine support placed for 3 weeks	0	No	Relief after 3 weeks
5	VERMA	2018	23	G1P0	23	Difficulty urinating, abdominal pain, perineal area pain, fever	Gartner's abscess	Anterior displacement of the cervix, detectable mass on the anterior vaginal wall	Pelvic ultrasound	urinary catheterization, transabdominal abscess puncture, fertility preservation, anti-inflammation	0	No	Discharged at 26 weeks gestation

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6	KIM	2018	34	menstruation	7	Frequent urination, dysuria	Adenomyosis, suspected uterine incarceration in pregnancy	—	MRI, ultrasound	Catheterization of 850 mL, manual repositioning of uterus, placement of uterine support (removed at 15 weeks gestation)	0	No	Live birth at 38 weeks gestation
			31	G1P0	6	Difficulty urinating, back pain	Fibroid tumor of posterior wall of uterus, consider pregnancy uterine incarceration	The posterior dome is full, the cervix is anteriorly displaced, and a large mass can be found in the fundus of the posteriorly tilted uterus.	Ultrasound	Catheterization, uterine repositioning by manipulation, failure of uterine support, vaginal gauze filling, gauze removal after 1 d	1	No	Miscarriage at 7 weeks' gestation
7	WU Zhimin	2019	38	G2P1	17	Occasional abdominal distension	No	Cystic abdominal mass, poor mobility, solid sounds on percussion	Ultrasound	Urinary catheterization, prevention of infection, fertility preservation	7	Yes, indwelling urinary catheter for 7 d	No recurrence of acute urinary retention in pregnancy, cesarean section at 39 weeks of gestation
8	GAO Lili	2019	39	G3P1	10	Progressive dysuria, mild abdominal pain	Uterine incarceration in pregnancy	The bladder can be reached above the pubic bone, the cervix is difficult to expose, the posterior vaginal vault is full, and the uterus is tilted posteriorly	Ultrasound	Ultrasound catheterization 420 mL, manual repositioning of uterus	0	No	Live birth at 40 weeks gestation
			38	G3P1	12	Progressive dysuria	Uterine incarceration in pregnancy		Ultrasound	Urinary catheterization, manual repositioning of uterus	0	No	Cesarean section for severe preeclampsia at 36 weeks' gestation
			29	G2P0	12	Difficulty in urination	Uterine incarceration in pregnancy		Ultrasound	Catheterization 550 mL, manipulation of uterus	0	No	—
			29	G2P1	13	Difficulty in urination with lower abdominal distension	Uterine incarceration in pregnancy		Ultrasound	Urinary catheterization 680 mL, manipulation of uterus	0	No	—

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9	HAN	2019	25	G1P0	16	Difficulty in urination with lower abdominal distension	Uterine incarceration in pregnancy, after treatment for lymph node tuberculosis	Inability to expose and palpate the cervix, uterine fundus in the sacral recess	Ultrasound	Catheterization 1,075 mL, manual repositioning of the uterus	0	No	Live infant delivered at 38 weeks' gestation
10	DUAN Yingyung	2021	22	G1P0	15	Difficulty in urination	Prolapsed uterus, suspected gestational uterine incarceration	Bladder bottom flat umbilicus, refused to press	Ultrasound	Urinary catheterization 1,750 mL, uterus returned to normal 1 d later	1	yes, prolapse again after 2 d, urinary retention recurred, urinary catheter was given	Yes, after 2 days, the uterus prolapsed again, urinary retention recurred, and a urinary catheter was placed
11	ZHUANG	2021	31	G2P0	13	Frequent urination, intermittent dysuria, vaginal bleeding	Urinary tract infection	Cervical displacement, uterine tilt	Ultrasound, urine culture	Indwelling urinary catheter, anti-inflammatory, manual repositioning of the uterus, lap-thoracic position	5	No	live baby delivered at 38 weeks' gestation
			27	G1P0	13	Abdominal pain, intermittent urinary retention	Abdominal pain, intermittent urinary retention	Uterus tilted posteriorly	Ultrasound	Catheterization 1,200 mL, knee-chest position	5	No, intermittent catheterization required for 2 weeks	Uterus enlarged anteriorly after 17 weeks of gestation, symptoms improved
			31	G3P1	14	Abdominal distension, lower abdominal pain, fatigue, vulvar swelling, constipation	Acute renal failure	Vulvar swelling, pressure on vaginal opening, can only accommodate one finger	Ultrasound	Intermittent catheterization for 9 h, total catheterization 5 400 mL, normal bowel movement and renal function after 3 d	10	No	Miscarriage

6.2 Clinical characteristics of the above cases

(1) The age of onset was 22-42 years old, with an average of 31.2 years old, and patients ≥ 35 years old accounted for 31.6% (6/19); primigravid women accounted for 42.1% (8/19), and parturients accounted for 57.9% (11/19), with parturients being the most common; the onset of disease occurred in the sixth to twenty-third week of gestation, with 10 cases in early gestation, 9 in midgravid women, and 78.9% (15/18) in the tenth to eighteenth week of gestation. The onset of the disease occurred at 6 to 23 weeks of pregnancy, 10 cases in early pregnancy, 9 cases in mid-pregnancy, and 10 to 18 weeks of pregnancy, accounting for 78.9% (15/19) of patients.

(2) The most common cause of uterine incarceration in pregnancy was uterine adenomyosis, posterior uterine wall fibroid, uterine prolapse, and posterior uterine position, accounting for 47.4% (9/19) of the cases. The remaining causes were bladder neck smooth muscle tumor, Gartner's abscess, and so on.

(3) Clinical manifestations were dominated by urinary symptoms. 17 out of 19 patients presented with urinary symptoms, of which 88.2% (15/17) presented with dysuria; the rest also presented with urinary frequency, dysuria, abdominal distension, abdominal pain, vaginal bleeding, vulvar swelling, pain in the perineum, fever, malaise, constipation, back pain, left upper abdominal pain, and nausea. Palpation of a full bladder in the lower abdomen is the main sign.

(4) Abdominal ultrasound as the main auxiliary examination method.

(5) Catheterization to relieve urinary retention is the primary symptomatic treatment followed by etiologic treatment. The duration of urinary catheterization was recorded in 18 cases. The duration of urinary catheterization was recorded in 18 cases, and 7 cases had indwelling urinary catheters for 1-10 d. Two cases had recurrence of urinary retention, and 1 case had indwelling urinary catheter removed for 1 d. Among them, 2 cases had recurrence of urinary retention, and 1 case had urinary catheterization for 1 d. The time of recurrence was between the time of catheterization and the time of removal of the urinary catheter. The recurrence of urinary retention occurred 2 days after the removal of the urinary catheter in one case, and one case was left with the urinary catheter in place for 1 week. One case had urinary retention after 1 week of urinary catheterization, and the urination was normal after 1 week of urinary catheterization. One case had urinary retention even after catheterization for 1 week and urinated normally after 1 week of catheterization. Treatment of etiology and sufficient time for indwelling urinary catheterization are the most important factors to prevent urinary retention. Treatment of etiology and sufficient time of indwelling urinary catheterization are important measures to prevent recurrence of urinary retention.

(6) Complications and pregnancy outcome: acute renal failure and urinary tract infection occurred in 1 case each; preterm labor in 3 cases and spontaneous abortion in 1 case. There were 3 cases of preterm labor, 2 cases of spontaneous abortion, and the rest of the pregnancies had good outcomes.

In summary, the incidence rate of urinary retention during pregnancy is low, with the prevalent age ranging from 22 to 42 years old, the average age is 31.2 years old, and it is more common in women who are pregnant; the prevalent gestational weeks are more common in the early and middle trimesters; uterine incarceration in pregnancy is the most common cause of morbidity due to a variety of reasons; the main clinical symptoms are difficulty in urination, and the main sign of touching the full bladder in the lower abdomen; the main auxiliary examination is abdominal ultrasonography, which can meet the needs of clinical diagnosis; catheterization can relieve urinary retention; and the main sign of urinary retention is the presence of the bladder in the lower abdomen. Catheterization to relieve urinary retention is the main symptomatic treatment, while etiologic treatment and sufficient time for indwelling urinary catheter are important measures to prevent recurrence. Clinical education should be strengthened during pregnancy, and pregnant women should avoid prolonged urinary holding and develop good urination habits during the fertile weeks to avoid the occurrence of urinary retention in pregnancy. Urinary retention in pregnancy can cause acute renal failure, urinary tract infection, miscarriage and other serious complications. Early diagnosis and early treatment are crucial, and clinical attention should be paid to timely symptomatic and causative treatment to avoid adverse outcomes and ensure the safety of mothers and infants.

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Reference

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